

## OPERATING SUMMARY

# KINGSTON

# **water pollution control plant**

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ONTARIO WATER RESOURCES COMMISSION

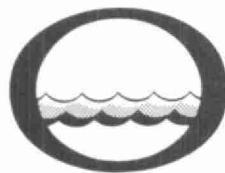
## Division of Plant Operations

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*Water management in Ontario*

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Commission

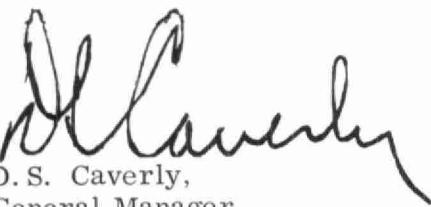
135 St.Clair Ave.W.  
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Ontario

We are pleased to present you with the Operating Summary for the water pollution control facilities operated for you during 1968.

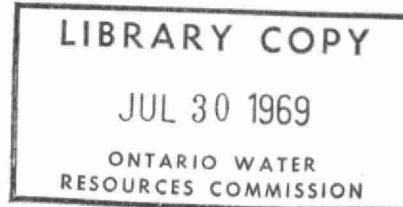
Both the financial and technical information presented should be of assistance to your present and future planning in this important phase of municipal activity.

A new format has been devised to allow greater readability with equally detailed content. We trust that this will meet with your approval.

Our staff wish to express their appreciation for your co-operation throughout the year.

  
D. S. Caverly,  
General Manager.

  
D. A. McTavish, P. Eng.,  
Director,  
Division of Plant Operations.



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**KINGSTON**  
**water pollution control plant**

operated for

THE TOWNSHIP OF KINGSTON

by the

ONTARIO WATER RESOURCES COMMISSION

**1968 ANNUAL OPERATING SUMMARY**

## FOREWORD

● This operating summary outlines the project's technical capabilities and financial status in 1968. Such information mirrors past and present performance, but a major intention is to anticipate the future -- to solve problems before they occur.

The new format in which this year's data are presented is designed to offer a higher level of readability than in the past, without a corresponding decrease in compactness, accuracy and detail.

Although your Regional Operations Engineer carries the major responsibility for the contents of the report, those involved in its preparation are attached to several Commission sections and divisions. The statistics section of the Division of Plant Operations compiled the information for the graphs and charts. The draughting section of the Division of Sanitary Engineering drew the graphs. The Division of Finance provided all cost data.

Only the close co-operation of these departments allowed the publication of this summary.

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## '68 REVIEW

The operating cost for the year was \$36,455.90, an increase of \$5,679.92 over 1967.

The unit cost of treating one million gallons decreased from \$119.02 in 1967 to \$116.09 in 1968. The operating cost increased, primarily due to increases in salaries and electrical power costs.

In 1968 the plant treated an average flow of 0.860 mgd, which was 104 percent of the design capacity of 0.830 mgd. This design flow was exceeded 52 percent of the time during the year. The percentage reduction of BOD and suspended solids was 92 and 87 respectively. The average BOD and suspended solids concentrations in the final effluent were 44 mg/l and 100 mg/l and the average concentrations of BOD and suspended solids in the raw sewage strength were 544 mg/l and 746 mg/l respectively.

In 1967 the average concentrations of BOD and suspended solids in the raw sewage were 291 mg/l and 810 mg/l respectively.

### OPERATING PROBLEMS

The plant process was interrupted again in 1968 with unusual high sludge volume indices resulting in the escape of solids over the final tank weirs into the plant effluent. This was caused largely by septic tank dumpings into the sewer system, resulting in high instantaneous BOD and suspended solids. The activated sludge process cannot handle sludge loadings such as these, and a review of the plant efficiency table showed unusually high BOD concentrations in the influent and effluent.

An automatic sampler was constructed in 1968 and was used to obtain more composite samples to determine a more accurate loading on the plant.

The No. 4 pumping station located on Bath Road was damaged by lightning. To eliminate damage of this type in the future, lightning arresters were installed at the plant and the pumping stations.

The return sludge line broke in 1968 and necessitated a major repair job.

A sludge hauling tender was let in 1968 and awarded to the lowest bidder, Smith Bros., of Odessa, Ontario for \$1.69 per cubic yard.

### MODIFICATIONS

The controls to the No. 3 pumping station located on Crerar Boulevard were modified in 1968 so that both pumps would operate in parallel as recommended in the R. V. Anderson Report. The Day's Road pumping station, which has experienced considerable difficulties with the mechanical seals, was re-equipped with a fresh water system.

Alterations were also made to electrical connections to facilitate the removal of equipment when problems occurred. The alarm system was extended to include the No. 4 pumping station located on Bath Road. A new wearing ring assembly was installed on the No. 1 pump located at the plant.

## **PROJECT COSTS**

NET CAPITAL COST (Final)	\$1,531,682.15
DEDUCT - Payments from Municipalities	\$156,782.00
- Portion Financed by CMHC-MDLB (Final)	<u>431,721.56</u> <u>588,503.56</u>
Long Term Debt to OWRC	\$ <u>943,178.59</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1968	\$ <u>24,171.91</u>
Net Operating Debt Retirement Reserve	\$ 36,455.90 23,636.00 9,231.10 <u>52,953.25</u>
Interest Charged	
TOTAL	\$ <u>122,276.25</u>

### RESERVE ACCOUNT

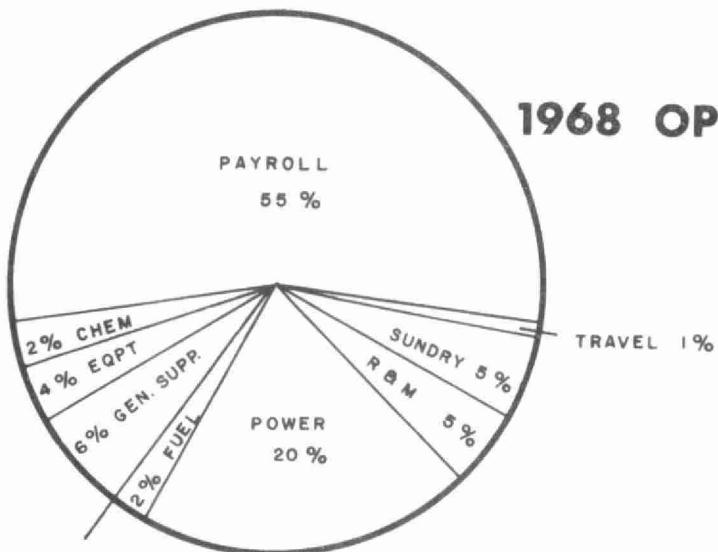
Balance at January 1, 1968	\$ 33,318.31
Deposited by Municipality	9,231.10
Interest Earned	2,119.19
	<hr/>
	\$ 44,668.60
Less Expenditures	<u>2,000.00</u>
Balance at December 31, 1968	\$ <u>42,668.60</u>

## Monthly Operating Costs

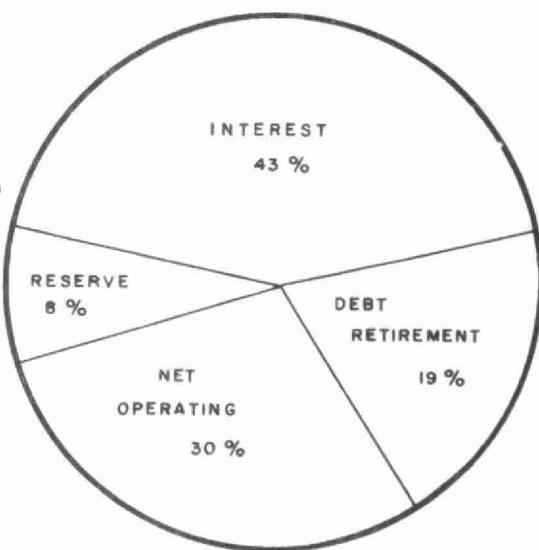
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDY	WATER	TRAVEL
JAN	2167.92	1337.21	-	-	598.20	-	30.18	-	202.33	-	-	-
FEB	2825.69	1372.47	-	132.30	648.60	123.64	277.95	26.00	139.32	105.41	-	-
MAR	3581.59	2126.20	-	205.80	566.52	-	177.79	137.39	264.32	103.37	-	-
APRIL	2635.82	1380.53	-	102.90	570.19	10.00	171.01	258.50	114.07	28.62	-	-
MAY	2649.51	1314.35	-	79.38	656.22	238.61	90.70	77.62	15.95	176.68	-	-
JUNE	2327.00	1390.19	-	-	526.78	-	218.23	-	146.42	45.38	-	-
JULY	2173.44	1324.00	-	-	-	238.61	214.17	-	232.00	95.55	-	69.05
AGS	3233.01	1982.03	-	73.50	680.94	-	-	356.65	56.62	83.27	-	-
SEPT	2292.66	1397.25	-	-	525.28	-	191.83	-	136.00	42.30	-	-
OCT	3509.24	1415.99	126.96	-	1244.58	305.87	303.15	52.50	35.06	115.13	-	-
NOV	3021.55	1327.02	-	-	682.54	-	196.46	124.34	88.70	538.99	-	63.50
DEC	5948.47	3503.73	(126.96)	107.57	658.49	-	462.41	574.28	281.65	398.85	-	88.45
TOTAL	36455.90	19871.03	-	701.45	7358.34	916.73	2334.08	1607.28	1712.44	1733.55		221.00

BRACKETS INDICATE CREDIT

## 1968 OPERATING COSTS



## TOTAL ANNUAL COST



## Yearly Operating Costs

YEAR	M.G.TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1964	111. 630	\$23, 296. 77	\$214. 34	43 1/2 cents
1965	181. 105	23, 348. 09	128. 92	10 cents
1966	186. 699	25, 674. 25	137. 52	7 cents
1967	258. 570	30, 775. 98	119. 02	4 cents
1968	314. 02	36, 455. 90	116. 09	2 cents

## **Process Data**

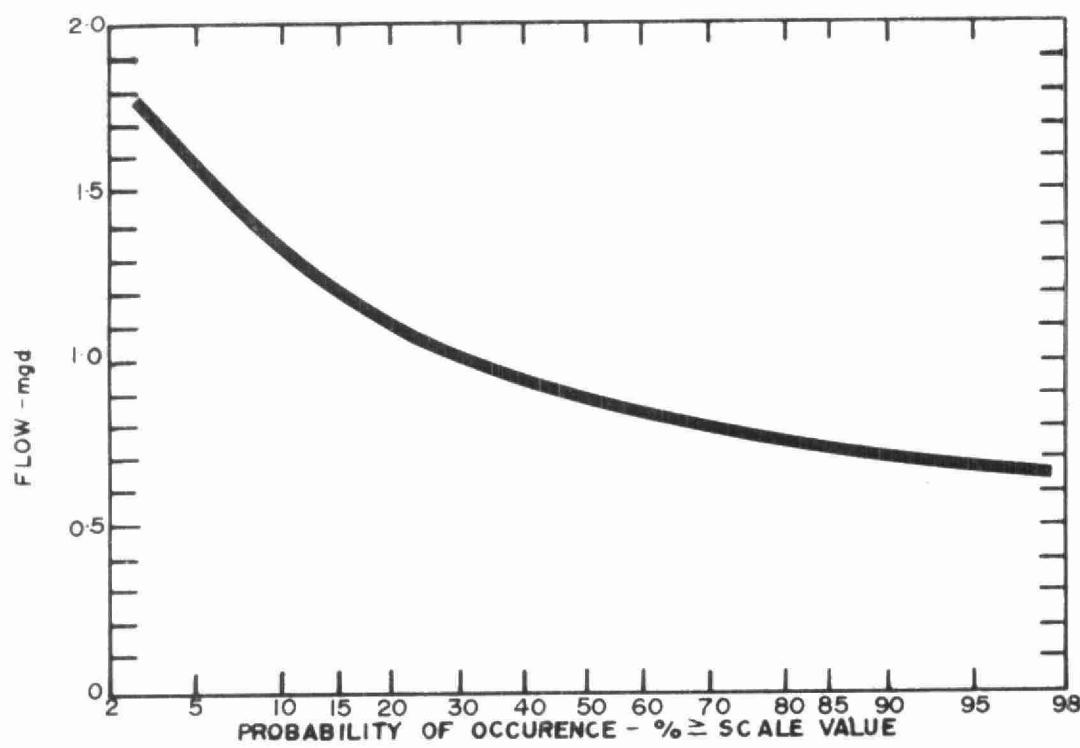
The probability of flows graph showed that the flows to the plant exceeded the design flow approximately 52% of the time.

Chlorination is practised for plant effluent disinfection. The chlorination season is from May to October inclusive. An average dosage of six mg/l was required to obtain a chlorine residual of 0.5 mg/l after a 15-minute contact.

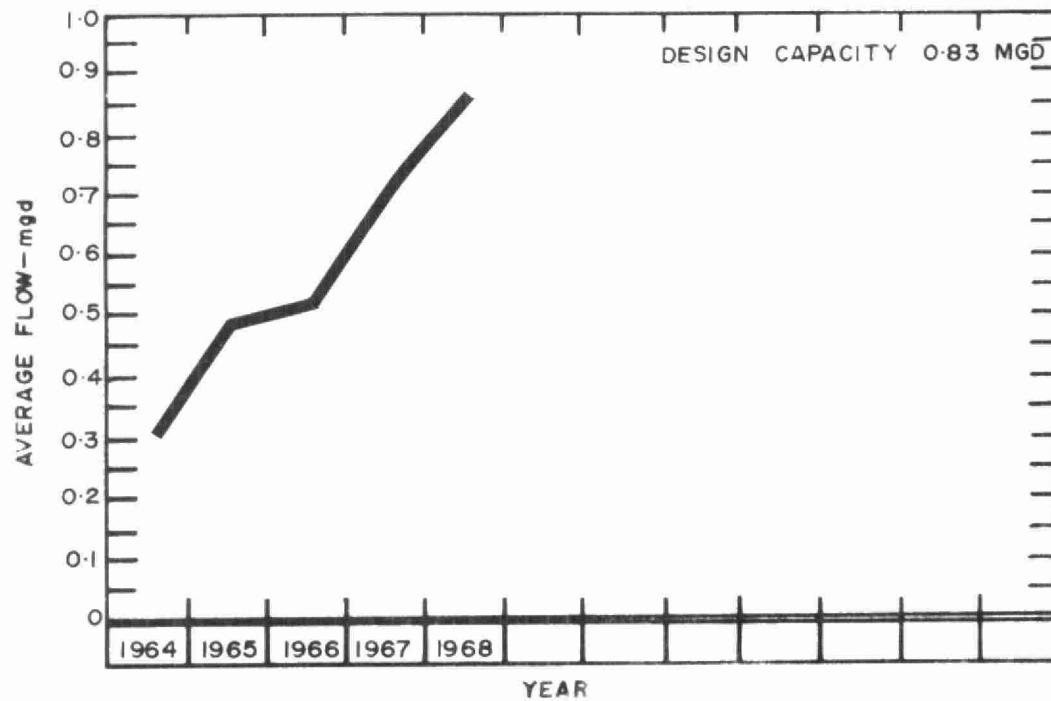
## PLANT FLOWS and CHLORINATION

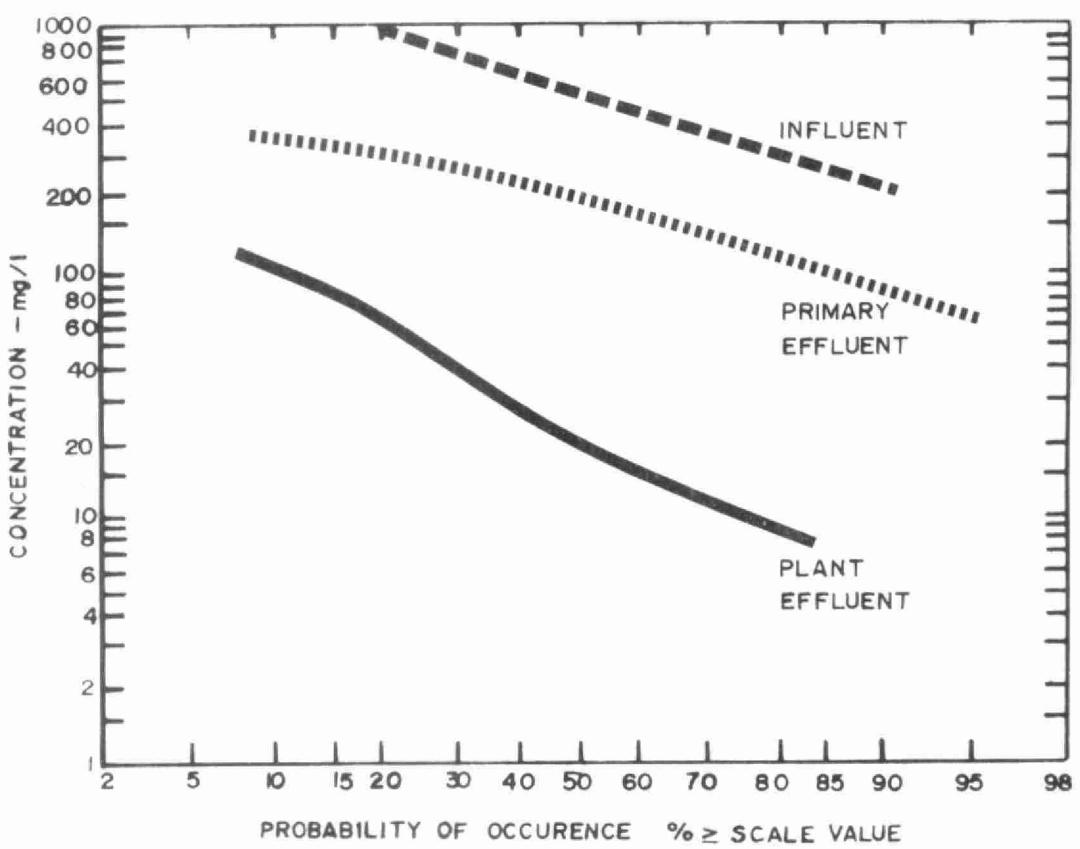
MONTH	TOTAL FLOW mg	AVERAGE DAILY FLOW mg	MAXIMUM DAILY FLOW mg	MINIMUM DAILY FLOW mg	CHLORINE USED lbs.	DOSAGE mg/l
JAN	21.22	.684	1.156	.572	(7) 152	3.2
FEB	22.04	.760	2.167	.562	(7) 59	1.1
MAR	32.13	1.036	1.864	.594	(11) 111	1.0
APR	25.50	.850	1.458	.572	(14) 140	1.2
MAY	28.47	.918	2.229	.573	712	3.1
JUN	25.35	.845	1.625	.628	733	2.9
JUL	22.82	.736	.864	.583	675	3.0
AUG	22.54	.727	.906	.594	874	3.9
SEPT	25.24	.841	1.772	.593	685	2.7
OCT	24.74	.798	1.246	.615	841	3.4
NOV	34.14	1.138	2.333	.697	(3) 87	2.5
DEC	29.83	.962	2.292	.604	-	-
TOTAL	314.02	-	-	-	5069	-
AVERAGE	-	.860	-	-	-	2.6

Number in brackets refers to number of days for which chlorine was used for process control only.

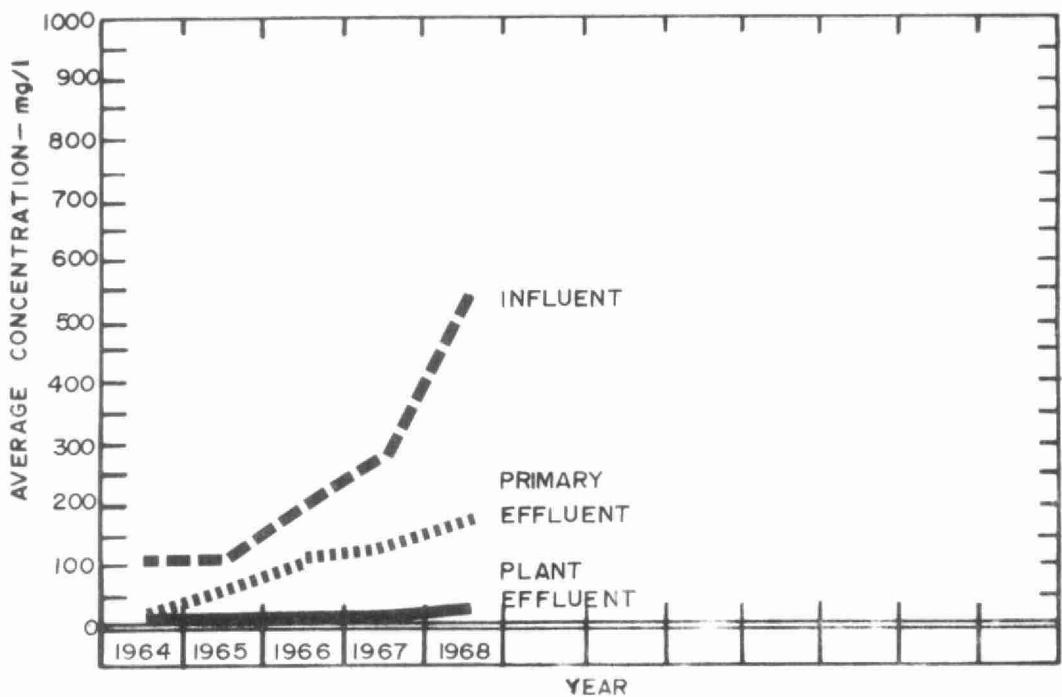


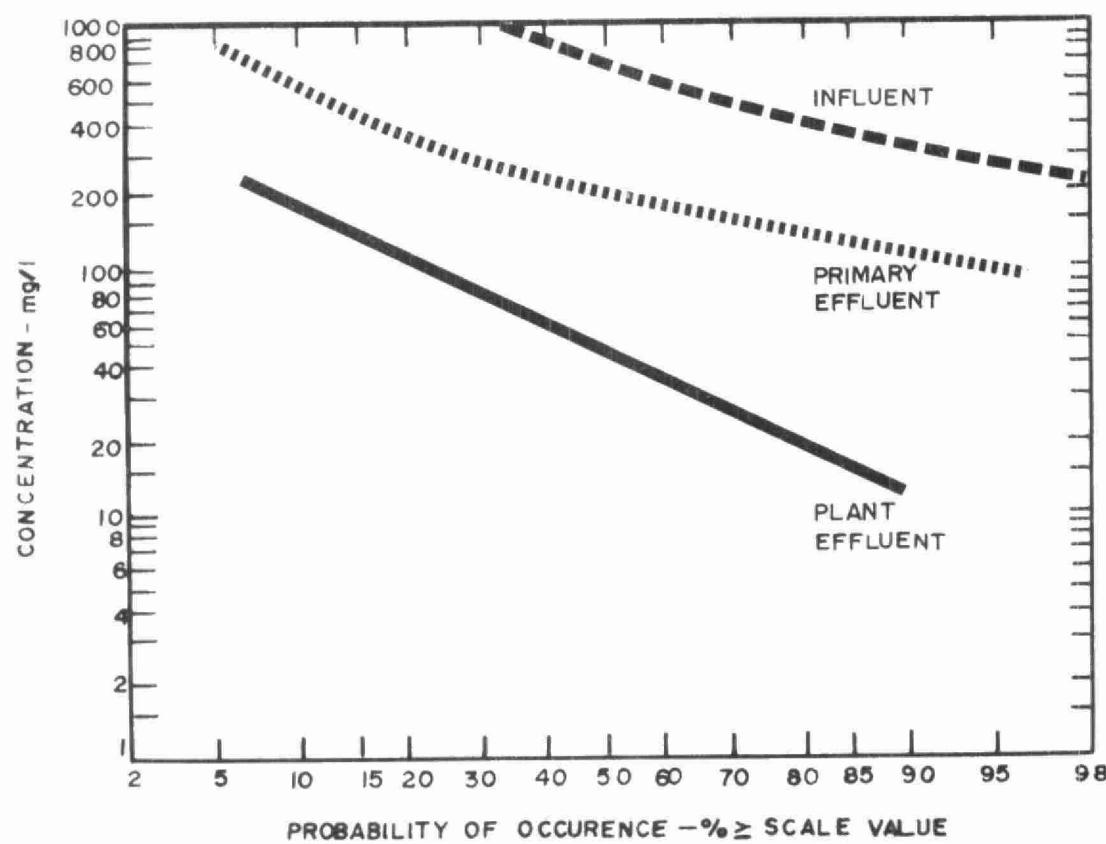
## FLows



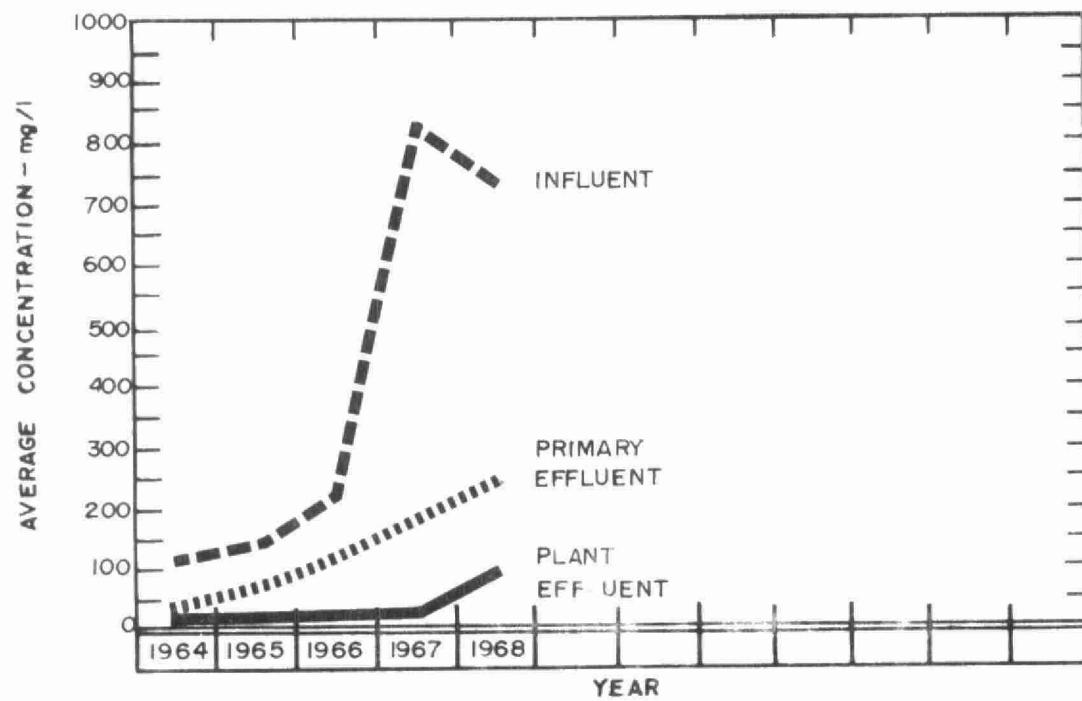


## BIOCHEMICAL OXYGEN DEMAND





## SUSPENDED SOLIDS



## PLANT EFFICIENCY

MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL ft <sup>3</sup>
	INF CONC <sup>N</sup> mg/l	EFF CONC <sup>N</sup> mg/l	RED <sup>N</sup> %	REMOVAL 10 <sup>5</sup> lb	INF CONC <sup>N</sup> mg/l	EFF CONC <sup>N</sup> mg/l	RED <sup>N</sup> %	REMOVAL 10 <sup>5</sup> lb	
JAN	253	7	47	.52	360	11	97	.74	7
FEB	300	35	88	.59	299	23	92	.61	0
MAR	540	7	99	1.71	845	18	98	2.66	12
APR	883	16	98	2.21	916	11	99	2.31	15
MAY	360	340	6	.06	830	846	0	0	0
JUN	325	3	99	.82	389	1	99	.98	15
JULY	150	2	98	.34	210	2	99	.47	10
AUG	664	23	96	1.45	927	39	96	2.00	0
SEPT	750	80	89	1.69	1771	196	89	3.97	8
OCT	1605	4	100	3.96	1173	23	98	2.84	30
NOV	590	11	98	1.98	872	24	97	2.89	31
DEC	105	6	94	.30	355	8	98	1.03	10
TOTAL	-	-	-	16.63	-	-	-	20.50	138
AVERAGE	544	44	92	1.30	746	100	87	1.86	11

### COMMENTS

The average concentration of BOD and suspended solids in the influent were 544 and 746 mg/l respectively. Samples collected at the plant were analysed at the OWRC Laboratory. Very high concentrations were obtained from composite samples, and result from the dumping of the contents of septic tanks into the sewers. The average concentrations of BOD and suspended solids in the plant effluent were 44 and 100 mg/l respectively. These concentrations do not meet the objectives of the OWRC.

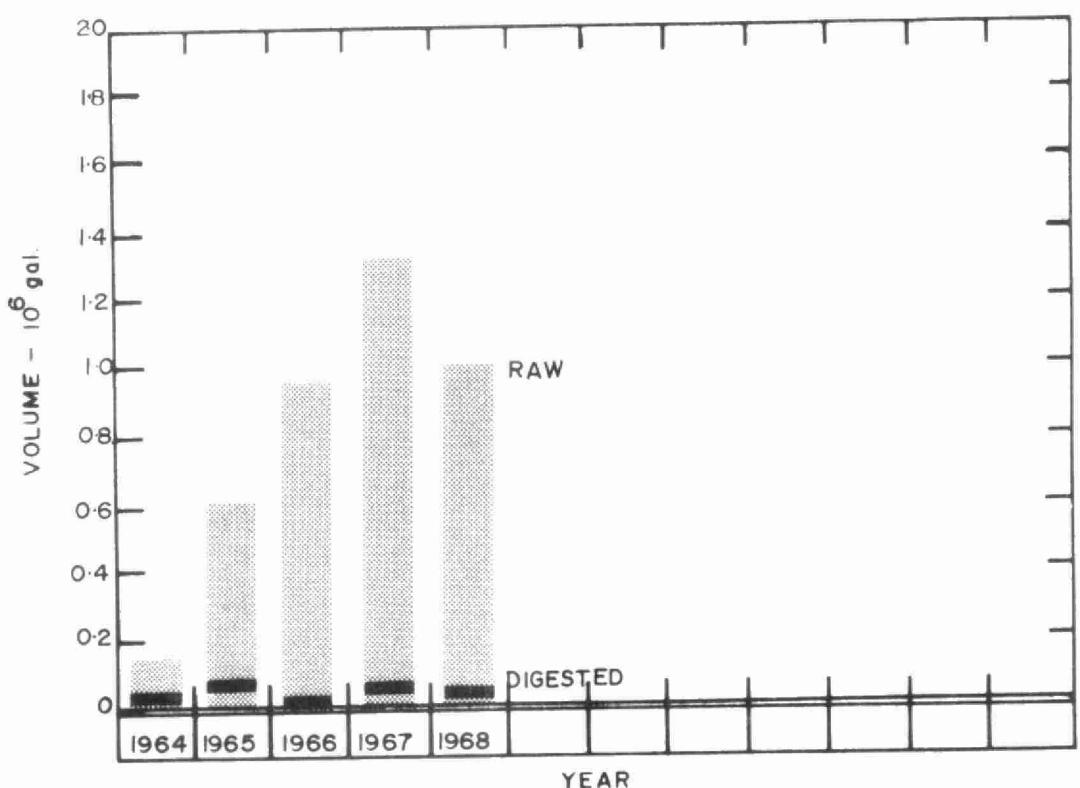
A total of 831 tons of BOD and 1,025 tons of suspended solids was removed from the waste in 1968. This is an increase of 465 tons of BOD and three tons of suspended solids from that of 1967. The amount of grit removed from the waste in 1968 was 0.44 cubic feet per mg.

## AERATION

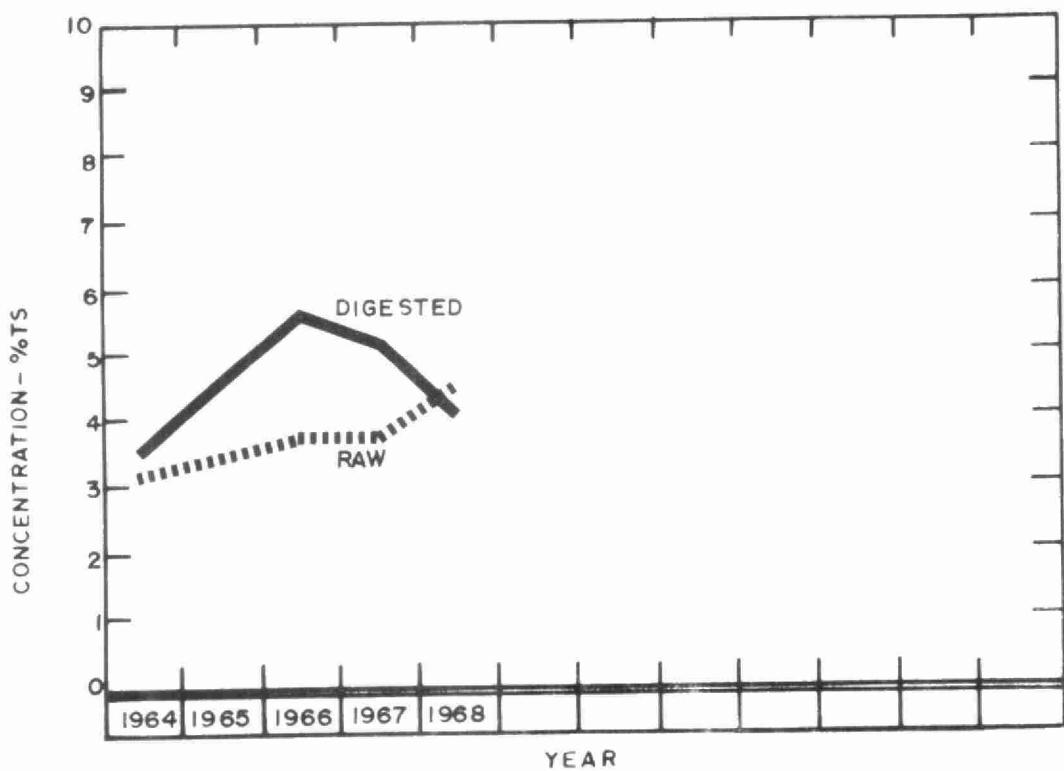
MONTH	AVERAGE FLOW mgd	PRIMARY EFF		SECONDARY EFF		MLSS CONC <sup>n</sup> mg/l	F/M (lb BOD lb MLSS)	AIR USED 1000 ft <sup>3</sup> lb BOD REMOVED	WASTE SLUDGE 10 <sup>3</sup> lb
		BOD CONC <sup>n</sup> mg/l	SS CONC <sup>n</sup> mg/l	BOD CONC <sup>n</sup> mg/l	SS CONC <sup>n</sup> mg/l				
JAN	.684	64	88	7	11	2,420	.07	3.38	49.8
FEB	.760	235	266	35	23	2,540	.27	.84	17.3
MAR	1.036	300	358	7	18	2,490	.48	.45	0.5
APRIL	.850	135	140	16	11	3,250	.13	1.26	2.3
MAY	.918	330	686	340	846	2,440	.47	-	1.9
JUN	.845	165	136	3	1	1,190	.44	.95	0.0
JUL	.736	116	93	2	2	1,460	.22	1.44	0.5
AUG	.727	120	178	23	39	1,210	.27	1.77	0.0
SEPT	.841	350	376	80	196	1,520	.73	.67	2.1
OCT	.798	170	259	4	23	1,790	.29	.96	1.4
NOV	1.138	185	213	11	24	1,600	.50	.64	1.4
DEC	.962	20	60	6	8	2,050	.03	9.46	96.5
TOTAL	-	-	-	-	-	-	-	-	170.7
AVERAGE	.860	183	238	45	100	1,997	.33	1.98	14.2

### COMMENTS

The average mixed liquor suspended solids concentration in the aeration tanks in 1968 was 1997 mg/l. The loading on the aeration section was 33 lbs. of BOD per 100 lbs. of MLSS sludge digestion and disposal.



## DIGESTION



# SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT		SLUDGE DISPOSAL	
	VOLUME 10 <sup>3</sup> gal	T. S. %	V.S. %	VOLUME 10 <sup>3</sup> gal	T. S. %	V.S. %	VOLUME 10 <sup>3</sup> gal	T. S. %	LIQUID yd <sup>3</sup>	DEWATERED yd <sup>3</sup>
JAN	68.9	2.6	75	0	-	-	-	-	-	0
FEB	55.1	3.6	70	10.0	-	-	-	-	-	0
MAR	77.8	8.3	72	11.0	-	-	-	-	-	0
APR	99.2	3.5	-	10.0	5.2	55	-	-	-	0
MAY	103.3	-	-	22.0	-	-	69.6	-	-	0
JUN	82.9	-	-	0	-	-	55.2	-	-	0
JUL	95.0	4.2	90	0	-	-	52.5	.38	-	0
AUG	79.6	-	-	0	-	-	62.6	-	-	59
SEPT	98.0	5.6	73	0	-	-	116.8	-	-	0
OCT	116.9	4.9	74	0	-	-	184.2	-	-	126
NOV	102.0	4.0	69	0.7	5.1	53	88.5	.24	41	54
DEC	101.7	5.0	-	0	2.0	-	81.2	.30	-	18
<b>TOTAL</b>	<b>1080.4</b>	-	-	<b>53.0</b>	-	-	-	-	<b>41</b>	<b>257</b>
<b>AVERAGE</b>	<b>90.0</b>	<b>4.6</b>	<b>75</b>	<b>4.4</b>	<b>4.1</b>	<b>54</b>	<b>89.1</b>	<b>.31</b>	-	<b>21</b>

## COMMENTS

In 1968 a total of 1,080,000 gallons of sludge was removed from the waste and pumped to the digester for further treatment. A total of 53,000 gallons of digested sludge and 713,000 gallons of supernatant was withdrawn from the digester. The average solids content of the raw sludge was 4.6 percent.

Although the plant is not equipped with a gas meter, it should be noted that considerable gas was produced and utilized in the heating of the sludge and buildings.

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## CONCLUSIONS

An engineering report has been authorized to study the future sewage collection and treatment as related to a planning report that has been accepted in principle by the Township of Kingston. Once this report has been prepared implementation of the recommendations should be initiated as soon as possible.

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